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THE CORROSION METHOD IN THE STUDY OF THE ANATOMY OF THE EAR.[1]

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The method of corroding away the tissues of an organ after filling its cavities with a congealing mass has been long and profitably employed in studying hollow structures, and most beautiful results have been thus obtained by many anatomists. Following the lead of Lieberkühn, Meckel, and others, Hyrtl made especial use of the procedure, and a fine series of his casts in wax, including some of the ear, is in the Mütter Museum. The ear, with its elaborate intricacy, is one of the organs in which the method can be most advantageously employed; and much has been done in this direction by Bezold, of Munich, whose valuable brochure upon the subject was published in 1882. Yet the method with wax was but a step in the advance to fine results; and the return to the use of fusible metal and the elaboration of the technique have furnished casts far more delicate, yet durable, than those before obtainable. Much credit for this advance, although a number of excellent casts made in metal by Dr. Goddard in 1831 may be seen in the Wister and Horner Museum, is due to Siebenmann, of Basle, who presented exquisite specimens of his work at the International Otological Congress in Brussels in 1888, and has since published an elaborate monograph upon the revelations thus made in the internal ear.

The writer was greatly impressed by the beauty of Siebenmann's specimens, and at once prepared to follow his example; but press of other work and lack of adequate material have long delayed the undertaking, and the preparations now presented form only a beginning of the series planned. It is hoped, however, that they will serve to bring the method into deserved notice, and that others will find how invaluable an aid it can be to them. Surely, in America, where perhaps fusible metal was first thus employed successfully, it ought to yield results second to none elsewhere obtained.

It is hardly necessary to point out that in this instance, contrary to what obtains in vascular preparations, the results gained are *negatives*, which represent the cavities, not the structures of the organ, and need

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for their full comprehension to be supplemented by preparations of the structures themselves. The important point is that they furnish tangible expressions of the details that are otherwise hardest to grasp; and as illustrating the value of such negatives, I can refer to the magnificent series of preparations by a similar but far more difficult and tedious method, with which Dr. Piersol captivated the Anatomical Congress in Wurzburg two years ago.

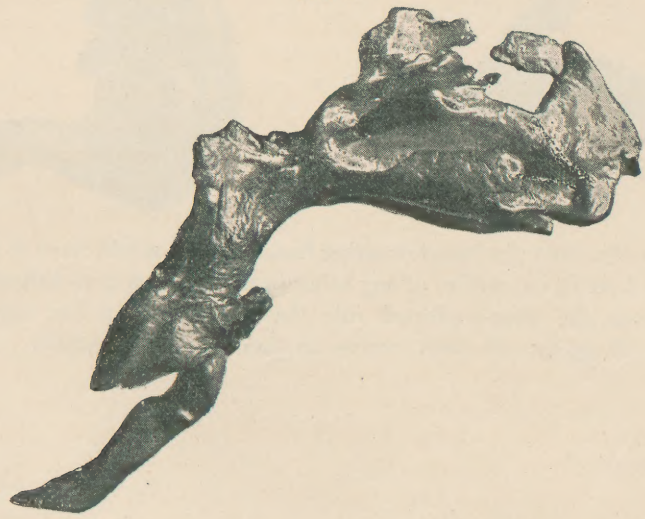
The essentials of the method are well known; but its minute details are noteworthy, since upon these refinements depends the perfection of modern results. The preliminaries vary with the organ to be moulded. If a macerated bone, such as the temporal, it is thoroughly dried and cleaned, is enclosed in linen so pasted on as to bridge the sulcus of the lateral sinus and other grooves, and to close all openings except the distal extremity of the carotid canal, into which a long paper funnel is glued. The whole is then imbedded in a large block of plaster, is thoroughly dried, and then warmed to about 200°. Wood's metal, a fusible alloy melting at 150° F., is melted upon a water-bath and poured in a full stream until the funnel is partly filled and the level ceases to sink. Quick cooling in water is followed by the removal of the plaster and linen envelopes, and the preparation is placed in a warm ten per cent. solution of caustic potash. Disintegration of the bone rapidly proceeds and will be largely accomplished in two weeks. The older procedure of picking away the remaining calcareous particles is too dangerous for the delicate portions of the cast, and is to be wholly avoided. The preparation is to be placed in a cold ten to fifteen per cent. solution of muriatic acid, which dissolves away the lime particles without injury to the metal beyond an occasional tarnishing. Superfluous metal is then cut away, and the specimen mounted for preservation. For the soft tissues, injection by means of a syringe is sometimes necessary, since it is hard to raise the organ to the proper temperature for free flow without macerating its surface too much.

An exquisitely minute injection of the tissues can be obtained by these means, and the resulting casts, while very delicate, will bear careful handling without fracture or distortion, and are admirably adapted for demonstration purposes.

The practical results of such preparations can be valuable in the extreme, not only from an anatomical point of view, but in their bearing on practice, as two of those presented well show. No amount of reading as to the form and continuity of the upper air-passages can possibly make as manifest their usual configuration and unity, as a cast obtained by pouring the metal into the trachea of the inverted head. The specimen (Fig. 1) is from a child of eight years, and falls far short of perfection; yet trachea, glottis, pharynx and nares are well shown, with clear indications of ventricles, fossæ of Rosenmüller, Eustachian tube-

mouths, and other adnexa. Hardly any of the metal has found its way into the oral cavity, merely enough to outline the size and position of the uvula—showing how isolated the mouth really is from the air-passages. A more successful preparation of this sort, which should give as a single mass of metal the Eustachian tubes, tympana, and mastoid cells in their continuity with these upper air-passages, would teach a

FIG. 1.



lesson in aural practice which many medical men have yet to learn. Still more instructive are the casts of the external auditory meatus, which are always viewed with scepticism at first, even by those having considerable knowledge of the ear. The tortuous form natural to the canal as shown in some specimens (Fig. 2), can be largely done away by drawing the auricle up and back (Fig. 3); but the extreme obliquity of the drum-membrane and the widening of the inner third of the canal to form a pocket close beneath it, are anatomical facts too generally unknown. The cases are still numerous where grave injury is done by the surgeon in endeavoring to extract foreign bodies. Without illumination, ignorant of the anatomy, and armed only with improper instruments and a determination not to come out empty-handed, he will plunge in and force the foreign body, if present, through the drum-head; or, if there be no foreign body, will tear away the ossicles as such. Twenty ears have been seriously damaged, by efforts to remove a foreign body, to every one that has suffered from its undisturbed presence. The cast of the normal auditory canal cannot be withdrawn without damage to it or to the canal, as these specimens well illustrate; for thinking the casting a failure, I tried to withdraw the readily-movable mass After

many failures, my utmost strength dragged it out (that of the other side broke off in the canal), and the repeated casting gives evidence of much laceration from the violence used. Yet this is in the undeveloped

FIG. 2.

FIG. 3.

meatus of a child; in the adult either bone or metal would have to break. As the forcible extraction of any other impacted mass is as difficult and dangerous, the often-neglected rule that the syringe is the only safe means for use in such cases receives another clear confirmation.